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Declarations under Rule 4.17:

- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii)) for all designations
- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii)) for all designations

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(54) Title: SYSTEM AND METHOD FOR SCALABLE MULTI-LEVEL REMOTE DIAGNOSIS AND PREDICTIVE MAINTENANCE

(57) Abstract: A system and method for remote diagnosis and predictive maintenance of devices, machines, and systems has been presented. The system detects signals of one or more operating and condition parameters and compares the detected signals to a signal model maintained locally with respect to the location of the device, machine, or system for anomalies. Information describing each anomaly is transmitted to a location remote from the device, machine, or system for diagnosis. The diagnosis includes an initial analysis of the information by diagnostic tools maintained at the remote location, a subsequent analysis of the information by diagnostic tools maintained elsewhere if the initial analysis fails to provide a diagnosis and a final analysis by a team of humans aided by a collaborative environment if the initial and subsequent analyses fails to provide a diagnosis. The diagnosis is transmitted to a maintenance service for repair of the device, machine, or system.

INTERNATIONAL SEARCH REPORT

 Int. nat. Application No
PCT/18 02/03409

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 G05B23/02 G05B9/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G05B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 97 15009 A (SYSTEMSOFT CORP) 24 April 1997 (1997-04-24) page 9, line 19 - page 12, line 5 ---	1-3
Y	WO 98 39718 A (EMERSON ELECTRIC CO) 11 September 1998 (1998-09-11) claim 1 page 8, line 3 - line 17 ---	1-3
A	EP 0 626 697 A (HITACHI LTD) 30 November 1994 (1994-11-30) page 6, line 26 - page 7, line 20 ---	1,7
A	EP 0 965 897 A (NELES CONTROLS OY) 22 December 1999 (1999-12-22) column 4, line 43 - column 10, line 53 ---	7
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☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- "A" document member of the same patent family

Date of the actual completion of the international search

18 February 2003

Date of mailing of the international search report

06. 05. 2003

Name and mailing address of the ISA

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KELPERIS K.

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INTERNATIONAL SEARCH REPORT

Int'l Application No
PCT/IB 02/03409

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6 181 975 B1 (MOTT JACK E ET AL) 30 January 2001 (2001-01-30) column 4, line 41 -column 8, line 15 ---	1,7
A	WO 01 48571 A (ASPEN TECHNOLOGY INC) 5 July 2001 (2001-07-05) page 8, line 16 -page 13, line 5 ---	1,7
A	US 5 311 562 A (PALUSAMY SAM S ET AL) 10 May 1994 (1994-05-10) -----	

Form PCT/ISA/210 (continuation of second sheet) (July 1992)

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB 02/03409**Box I Observations where certain claims were found unsearchable (Continuation of Item 1 of first sheet)**

This International Search Report has not been established in respect of certain claims under Article 17(2)(e) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of Item 2 of first sheet)

This International Searching Authority found multiple inventions in this International application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-11

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

Form PCT/ISA/210 (continuation of first sheet (1)) (July 1998)

International Application No. PCT/IB 02/03489

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-11

A method for remotely monitoring operations of a machine comprising: Detecting signals of the operating parameters of the machine, maintaining a model locally in order to identify anomalies by comparing the detected signals, transmitting relevant information to the remote location diagnosing the status of the machine using diagnostics tools and if a diagnosis fails to be implemented a final analysis is made by a team of humans and reports the diagnosis to a repairing station.

2. Claims: 12-19

A remote diagnostic tool for a machine connected via a communications link to a local monitoring tool. The remote diagnostic tool comprises: A first node for diagnosing the anomaly using tools available at the node, additional nodes on the network having access to additional diagnostic tools, interface between the first and the additional nodes and instructions at the first node for communicating the anomaly to one of the additional nodes if the tools at the first node fail to provide diagnosis.

3. Claims: 16-19

A remote diagnostic tool connected via a communications link to a local monitoring tool, the remote diagnostic tool comprises a local node diagnosing a machine anomaly including a first library of patterns describing systemic anomalies and a second library of patterns describing component anomalies and instructions at the node for diagnosing using first and second libraries

INTERNATIONAL SEARCH REPORT

Int'l Patent Application No.

PCT/IB 02/03409

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